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When do stop-loss rules stop losses?☆

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Abstract

We propose a simple analytical framework to measure the value added or subtracted by stop-loss rules—predetermined policies that reduce a portfolio's exposure after reaching a certain threshold of cumulative losses—on the expected return and volatility of an arbitrary portfolio strategy. Using daily futures price data, we provide an empirical analysis of stop-loss policies applied to a buy-and-hold strategy using index futures contracts. At longer sampling frequencies, certain stop-loss policies can increase expected return while substantially reducing volatility, consistent with their objectives in practical applications.

JEL classification: G11; G12

Keywords: Investments; Portfolio management; Risk management; Asset allocation; Performance attribution; Behavioral finance

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1. Introduction

Thanks to the overwhelming dominance of the mean–variance portfolio optimization framework pioneered by Markowitz (1952), Tobin (1958), Sharpe (1964), and Lintner (1965), much of the investments literature—both in academia and in industry—has focused on constructing well-diversified static portfolios using low-cost index funds. With little use for active trading or frequent rebalancing, this passive perspective comes from the recognition that individual equity returns are difficult to forecast and trading is not costless. The questionable benefits of day-trading are unlikely to outweigh the very real costs of changing one's portfolio weights. It is, therefore, no surprise that a "buy-and-hold" philosophy has permeated the mutual-fund industry and the financial planning profession.[1]

However, this passive approach to investing is often contradicted by human behavior, especially during periods of market turmoil.[2] Behavioral biases sometimes lead investors astray, causing them to shift their portfolio weights in response to significant swings in market indexes, often "selling at the low" and "buying at the high." On the other hand, some of the most seasoned investment professionals routinely make use of systematic rules for exiting and re-entering portfolio strategies based on cumulative losses, gains, and other "technical" indicators.

In this paper, we investigate the efficacy of such behavior in the narrow context of stop-loss rules (i.e., rules for exiting an investment after some threshold of loss is reached and re-entered after some level of gains is achieved). We wish to identify the economic motivation for stop-loss policies so as to distinguish between rational and behavioral explanations for these rules. While certain market conditions may encourage irrational investor behavior (e.g., large rapid market declines), stop-loss policies are sufficiently ubiquitous that their use cannot always be irrational.

This raises the question we seek to answer in this paper: When do stop-loss rules stop losses? In particular, because a stop-loss rule can be viewed as an overlay strategy for a specific portfolio, we can derive the impact of that rule on the return characteristics of the portfolio. The question of whether or not a stop-loss rule stops losses can then be answered by comparing the expected return of the portfolio with and without the stop-loss rule. If the expected return of the portfolio is higher with the stop-loss rule than without it, we conclude that the stop-loss rule does, indeed, stop losses.

Using simple properties of conditional expectations, we are able to characterize the marginal impact of stop-loss rules on any given portfolio's expected return, which we define as the "stopping premium." We show that the stopping premium is inextricably linked to the stochastic process driving the underlying portfolio's return. If the portfolio follows a random walk (i.e., independently and identically distributed returns) the stopping premium is always negative. This may explain why the academic and industry literature has looked askance at stop-loss policies to date. If returns are unforecastable, stop-loss rules simply force the portfolio out of higher-yielding assets on occasion, thereby lowering the overall expected return without adding any benefits. In such cases, stop-loss rules never stop losses.

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[1]This philosophy has changed slightly with the recent innovation of a slowly varying asset allocation that changes according to one's age (e.g., a "lifecycle" fund).

[2]For example, psychologists and behavioral economists have documented the following systematic biases in the human decisionmaking process: overconfidence (Fischoff and Slovic, 1980; Barber and Odean, 2001; Gervais and Odean, 2001), overreaction (DeBondt and Thaler, 1986), loss aversion (Kahneman and Tversky, 1979, 1992; Shefrin and Statman, 1985; Odean, 1998), herding (Huberman and Regev, 2001), psychological accounting (Kahneman and Tversky, 1981), miscalibration of probabilities (Lichtenstein, Fischoff, and Phillips, 1982), hyperbolic discounting (Laibson, 1997), and regret (Bell, 1982a,b; Clarke, Krase, and Statman, 1994).